

## ***Boloria eunomia* (Esper, 1799): a new species for Serbia (Nymphalidae)**

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**Abstract.** The discovery of the butterfly *Boloria eunomia* (Esper, 1799) on Mount Stara Planina in Serbia is described. This is the first record of this species for Serbia. The morphology is compared with that of the similar *Boloria rhodopensis* Slivov, 1995. The phytocenology of the habitat is portrayed and the distribution of the species on the Balkan Peninsula analysed. The degree of habitat endangerment for this species is discussed, and a proposal for the status of this species is given.

### **Introduction**

The Bog Fritillary, *Boloria eunomia* (Esper, 1799) (Fig. 1) has a circumboreal distribution in Eurasia (Western Europe, Russia, Siberia, Far East) and North America (Labrador to Alaska and along the Rocky Mountains). Data on its distribution on the Balkan Peninsula are sporadic. The first data on its presence were given by Drenowsky (1909, 1930) for the central part of Mount Stara Planina (Botev Massif, localities of Levski, Levski Chalet, all in Bulgaria), approximately 1600–1900 m above sea level. Higgins and Riley (1980) cited Drenowsky on this, as well as Abadjiev (1995). Kudrna (2002) does not mention the distribution of this species on the Balkan Peninsula. In the ex-Yugoslavia and present Serbia, this species was not known (Jakšić 1988; Parker and Jakšić 1996; Jakšić 1999; Zečević 2002). Unexpectedly, we recorded this species during field research from 18–19 July 2005 on Mount Stara Planina, Eastern Serbia.

### **Material and methods**

Specimens of *B. eunomia* were collected with butterfly nets on July 18 and 19, 2005. Samples are deposited in the authors' collections. The production of genitalia slides was done in a standard procedure: maceration in potash, washing to remove potash, dissecting and cleaning, staining, dehydrating and hardening, and mounting in Canada balsam.

### **Results**

**Habitat of *Boloria eunomia* (Esper, 1799) on Mount Stara planina.** We recorded this species at the locality of Babin Zub on Mount Stara Planina (Fig. 2 and 3), at an altitude of approximately 1700 m (44°22'N–22°35'E). This locality is situated some two



Fig. 1. *Boloria eunomia* drinking nectar from host-plant *Polygonum bistorta* on Mount Stara Planina (photo Chris van Swaay).

ceae), *V. uliginosum* (L., Ericaceae), *Juniperus nana* (Willd., Cupressaceae), *Bruckenthalia spiculifolia* (Rchb., Ericaceae) and *Luzula luzuloides* ((Lam.) Dandy & Wilmott, Juncaceae). The larval host plants (*Polygonum bistorta* L., Polygonaceae) are abundant.

**Collected material.** Altogether six males and four females were collected (Jakšić leg.; van Swaay leg.). Besides, we have all photographed the species itself, the larval host-plant, and the habitat. A slide of the genital armature of a male specimen was prepared and drawn as shown on Fig. 4.

## Discussion

The population of *B. eunomia* at Babin Zub is the second one on the Balkan peninsula. The other one is also in the Stara Planina range, approximately 250 km further east in Bulgaria. Both populations are very isolated, from each other as well as from the rest of the European populations (Fig. 5).

We compared the morphology and anatomy of Stara Planina specimens with illustrations given in Higgins and Riley (1980) and Tolman and Lewington (1997). It is evident that the key characteristics are identical. The only difference from specimens from the type locality (Kaliningrad, RU) is that the white cluster is discontinuous in cell S1b,

km from the mountain hut on the right-hand side of the road, across from the view point. The locality comprises wet meadows and marshy places with a peat bog represented by a characteristic vegetation (Association *Cardamino – Rumici – Calthetum* R. Jovanović, 1971). On higher terrains surrounding peak Babin Zub, numerous other small peat bogs are present in the drainage basins of rivers Dojkinačka Reka, Crnovrška Reka, and Jelovačka Reka.

On one side the locality borders montane beech forest (Association *Fagetum submontanum luzuletosum* Raj, 1956), comprising *Festuca drymeia* as well. On the other side, the locality borders meadows with subalpine bush vegetation (Association *Vaccinio – Juniperetum nanae* Mišić, 1964).

In the two meadow communities forming the habitat of *B. eunomia*, the dominating plantspecies are: *Vaccinium myrtillus* (L., Ericaceae), *V. vitis-idaea* (L. Erica-



**Figs 2–3.** Habitat of *B. eunomia*. 2. Mount Stara Planina. 3. Babin Zub Mountain (background) on Mount Stara Planina (photos Chris van Swaay).

on the discal part of the hindwing. The ground colour of the wings is somewhat darker, compared to that of specimens from the type locality. The genital armature of the dissected male specimen shows all elements characteristic for this species. The habitat of *B. eunomia* is similar to that of *Boloria rhodopensis* Slivov, 1995 that lives nearby (Rhodopes, Smoljan lakes, altitude 1600–1700 m). The shapes of the valva and phallus are significantly different, easily recognisable in comparison to the drawing given by Abadjiev and Beshkov (2000).

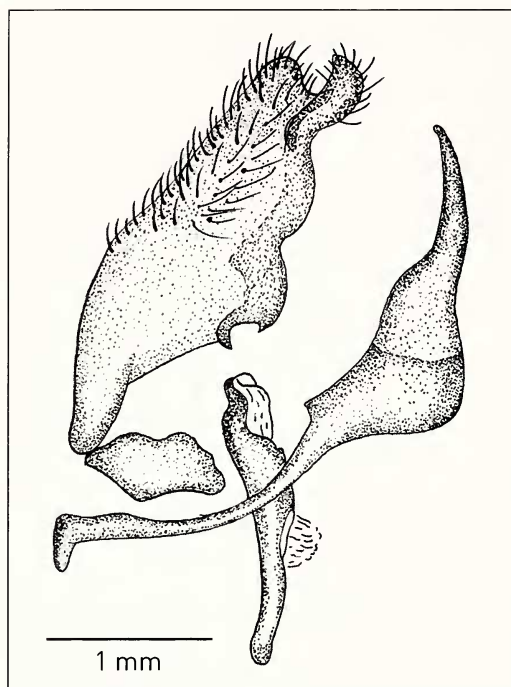


Fig. 4. Male genitalia of *Boloria eunomia* from Mount Stara Planina, July 19, 2005., Jakšić leg. (prep. no. 2281).

The biogeographic implications of the discovery of this species on Mount Stara Planina are very interesting. In the Stara Planina flora so far 147 endemic plant species have been recorded (10.40% of the total flora). This is an important sign of the biodiversity wealth of this area (Vučković and Randjelović 2004). A phytogeographic analysis of the endemic flora showed that the species are distributed in six main and two transitional areal-types. The main areal-types are Eurasian, Eurasian mountainous, Mediterranean-submediterranean, Central European, Arcto-Alpean, and Boreal, while the transitional types are Mediterranean-Pontic and Central European-Mediterranean-Pontic. The Central European areal-type comprises endemics divided into two main areal groups: Balcanic and Carpathean-Balcanic. The latter group includes only one species – *Eranthis hyemalis* (L.) Salisb. (Ranunculaceae), the only European representative of the genus. The

southern part of the European areal of *B. eunomia* also comprises the Balkan Peninsula, as well as the Pyrenees. According to the ecology and distribution of the species, we can conclude that it is preglacial in age and that it reached South Europe during one of the glacial periods.

Our two-days stay on Stara Planina didn't enable us to pay attention to the population structure of *B. eunomia*. The metapopulation dynamics of this species is very interesting and has been the subject of a study in the context of endangerment and protection (Sawchik et al. 2002; Baguette et al. 2003). The fragmentation of its wet peat bog and grassland habitat can negatively affect its survival. In Eastern Serbia, agricultural abandonment and deforestation are the main threats to *B. eunomia* and its habitat. The wet grasslands and peat bogs habitats used to be maintained by regular mowing and grazing. The bad economic situation in these remote parts causes local people to move to larger cities, thus abandoning grassland of low agricultural value, like the places where *B. eunomia* is found. Deforestation of the surrounding forest has a negative impact on the water circulation in the area, thus lowering the quality of the habitat.

Since the species was not known from Serbia, it wasn't included into the Red List, neither in the Red Book of Butterflies of Serbia. Having in mind the area of its distribution, fragility of the habitat, and size of the population, it is obvious that *B. eunomia* must be ranked as an Endangered species (E) in Serbia. This is especially important because this area of Stara Planina is one of the Prime Butterfly Areas of Europe (van Swaay & Warren 2003).



**Fig. 5.** European distribution of *Boloria eunomia*. The location of the new locality described in this paper is indicated with an arrow.

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